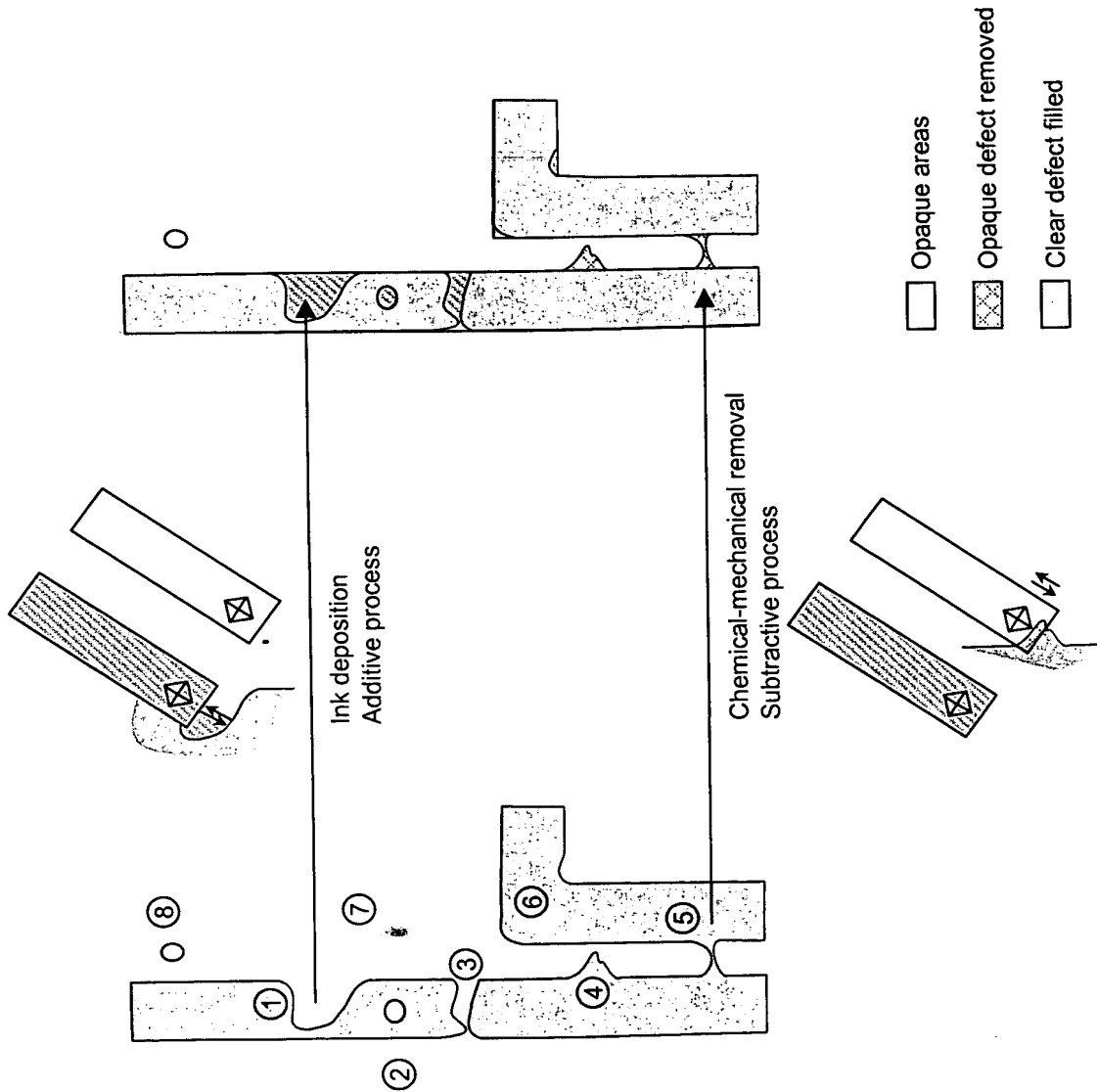
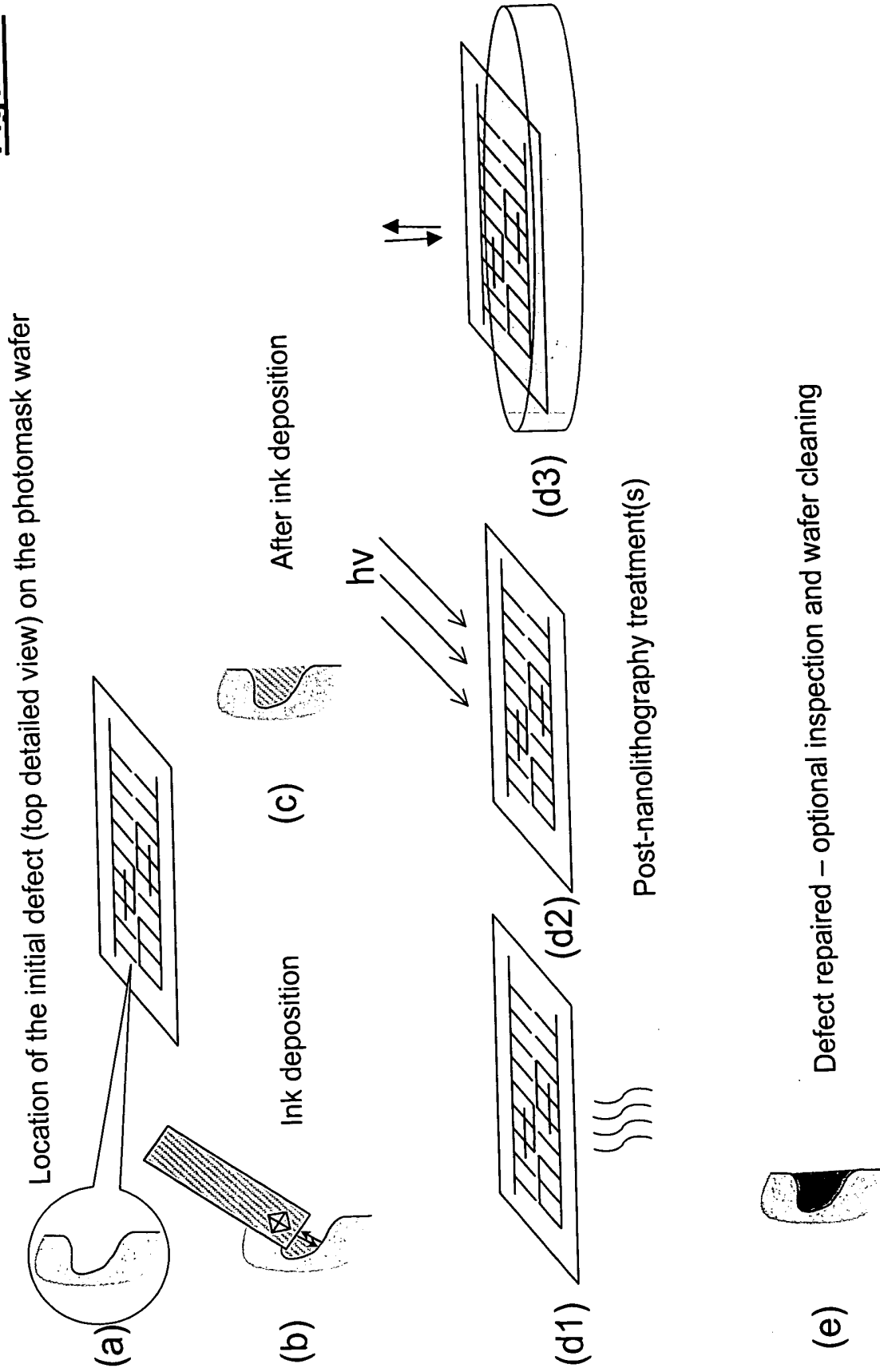


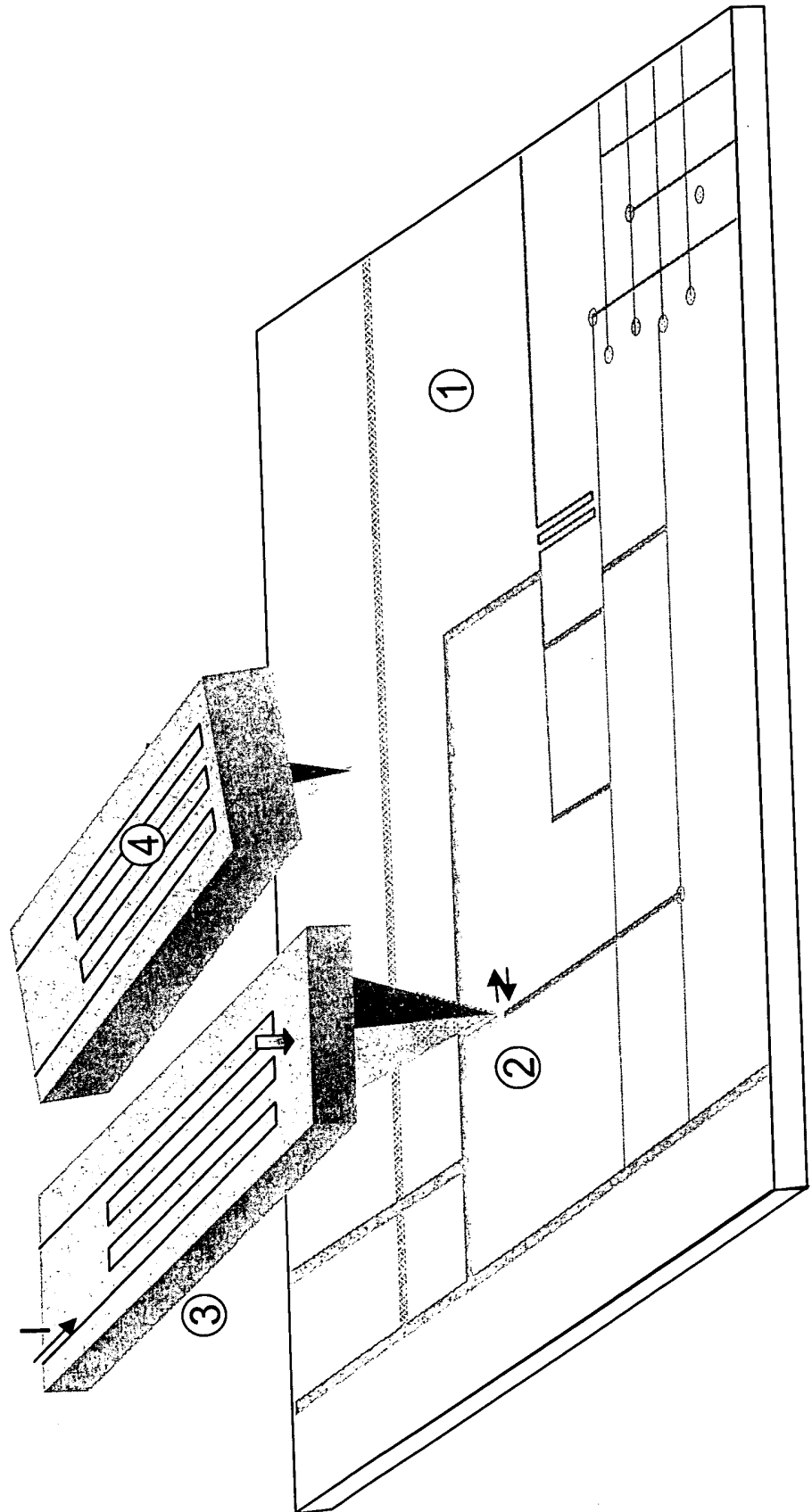
**Figure 1**



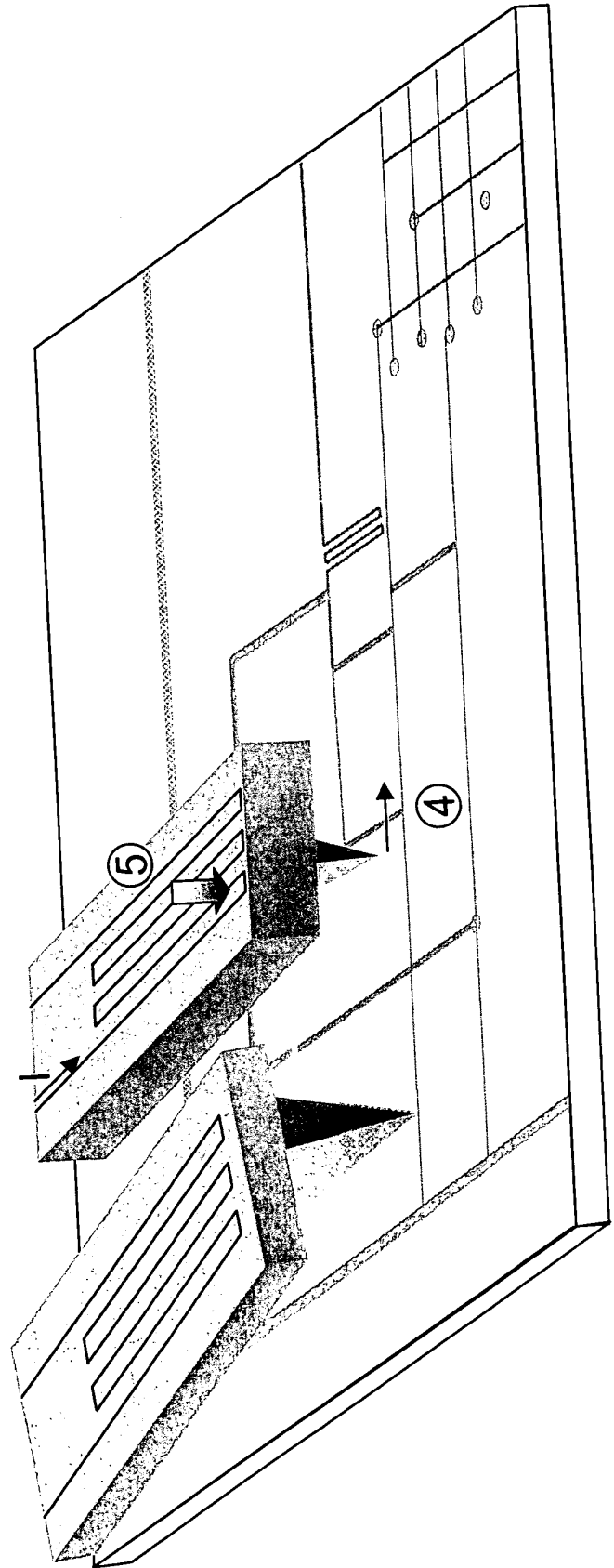
**Figure 2**



**Figure 3A**



**Figure 3B**



**Figure 4**

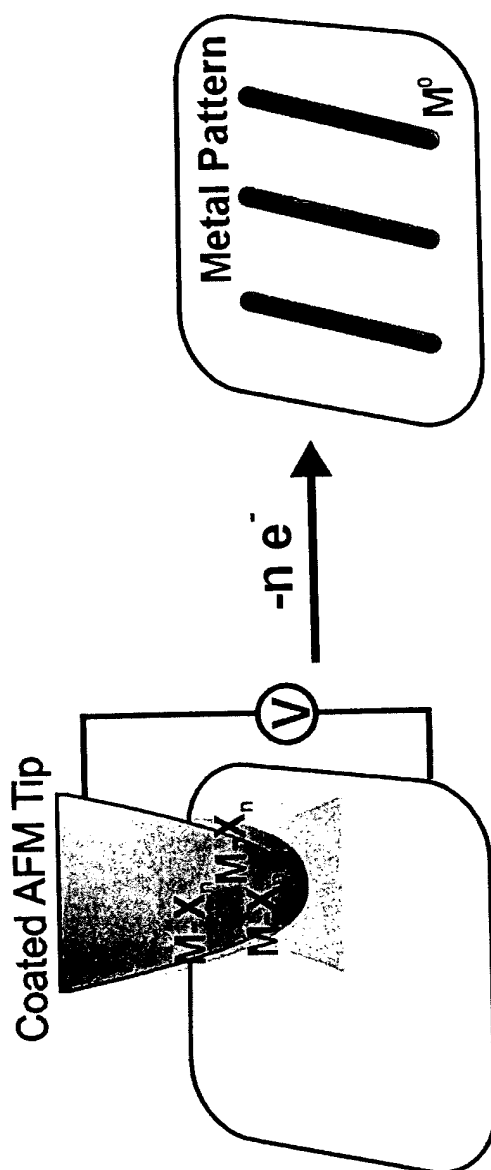
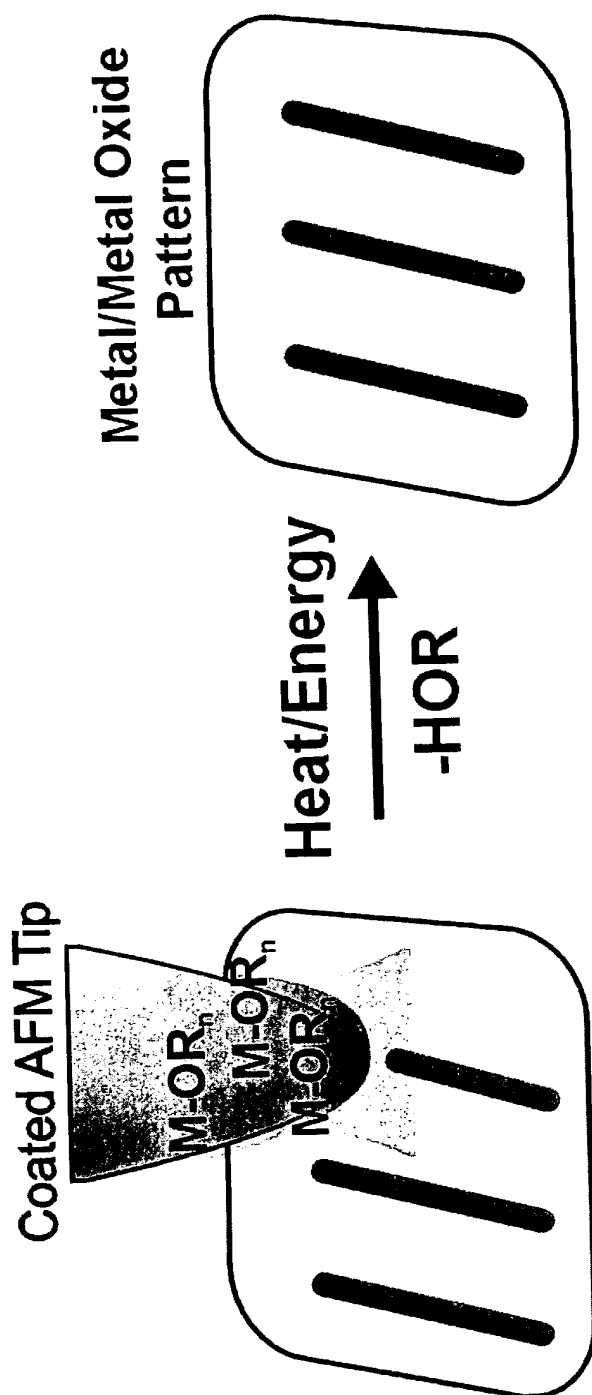
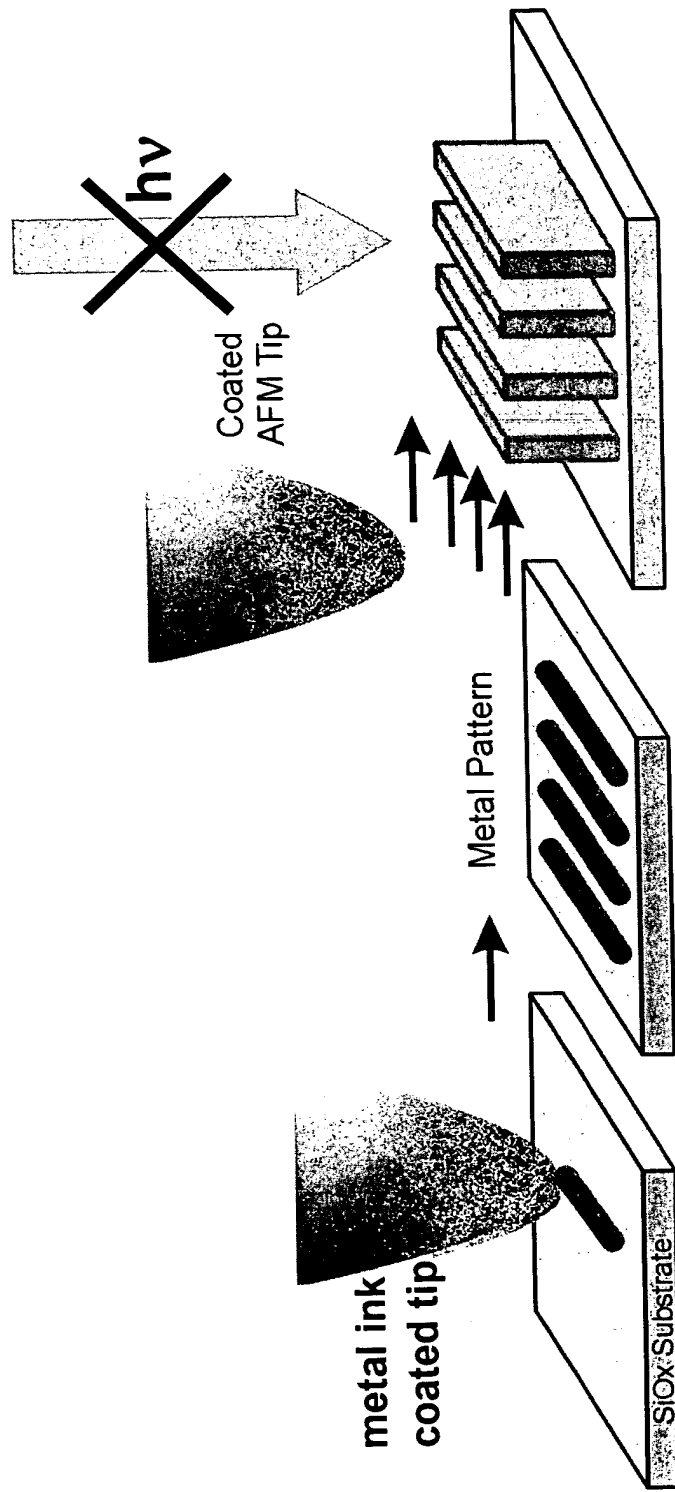


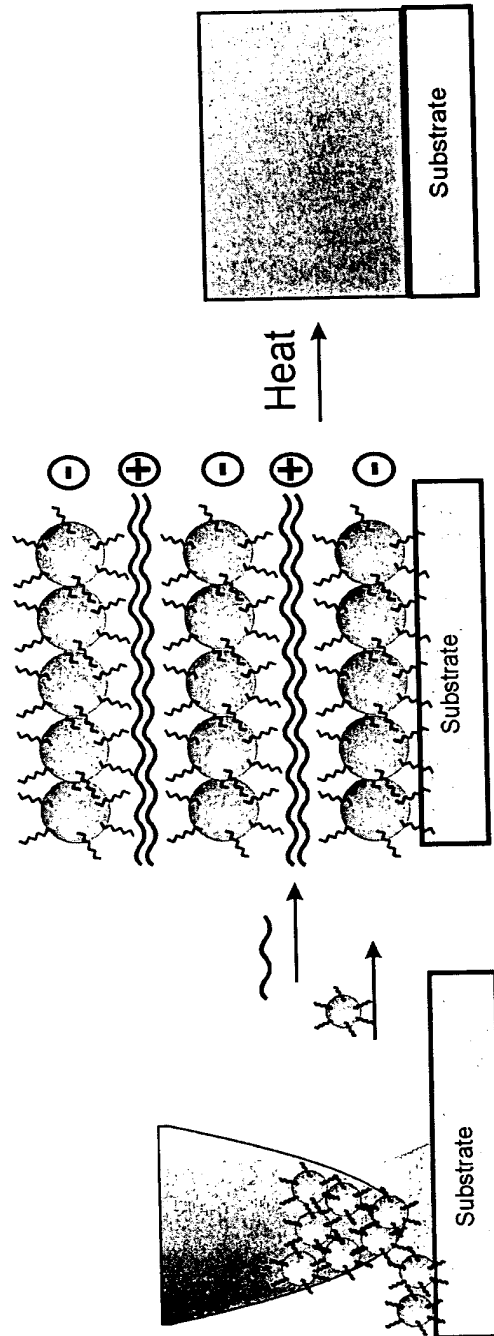
Figure 5



**Figure 6**

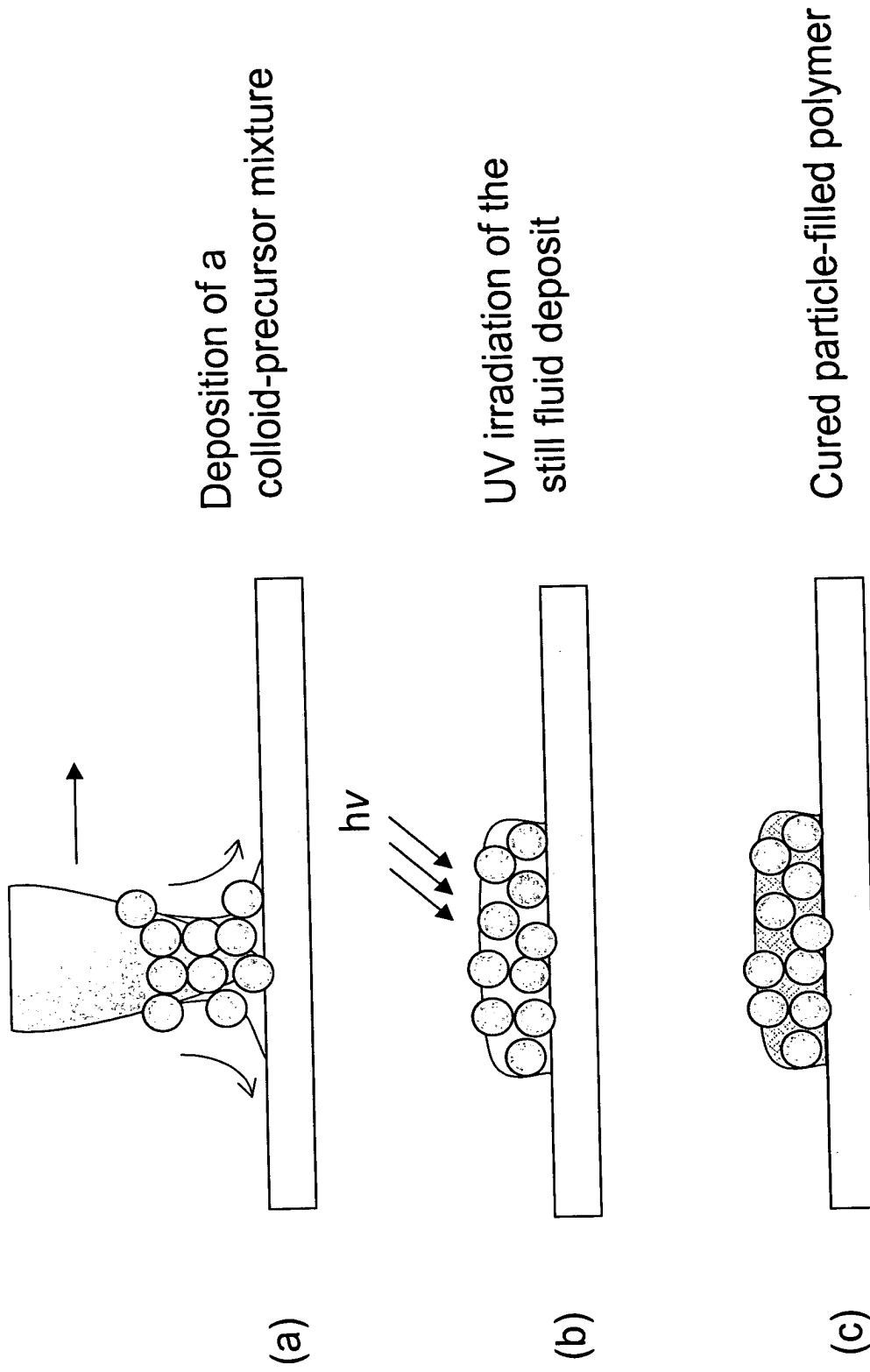


**Figure 7**

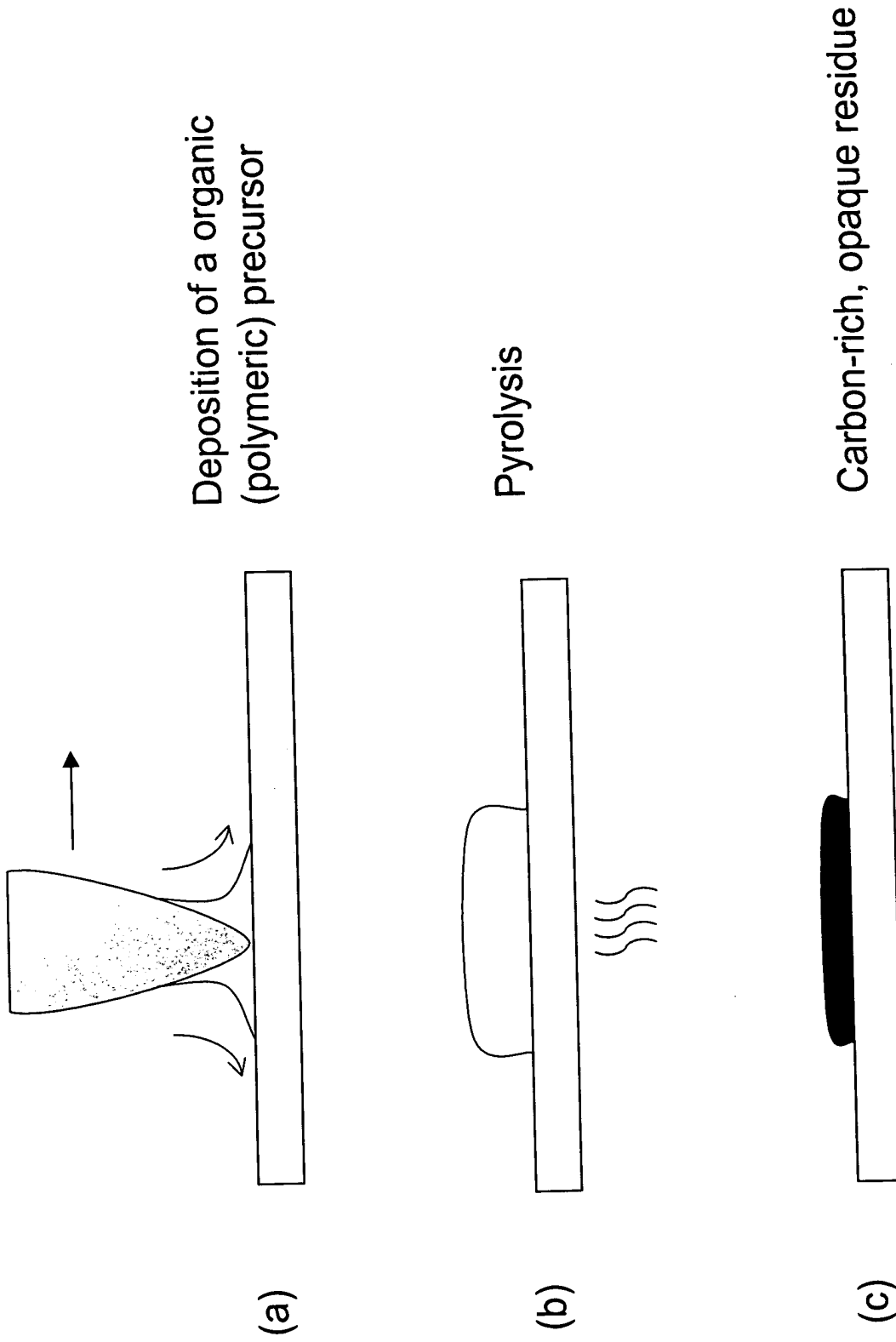




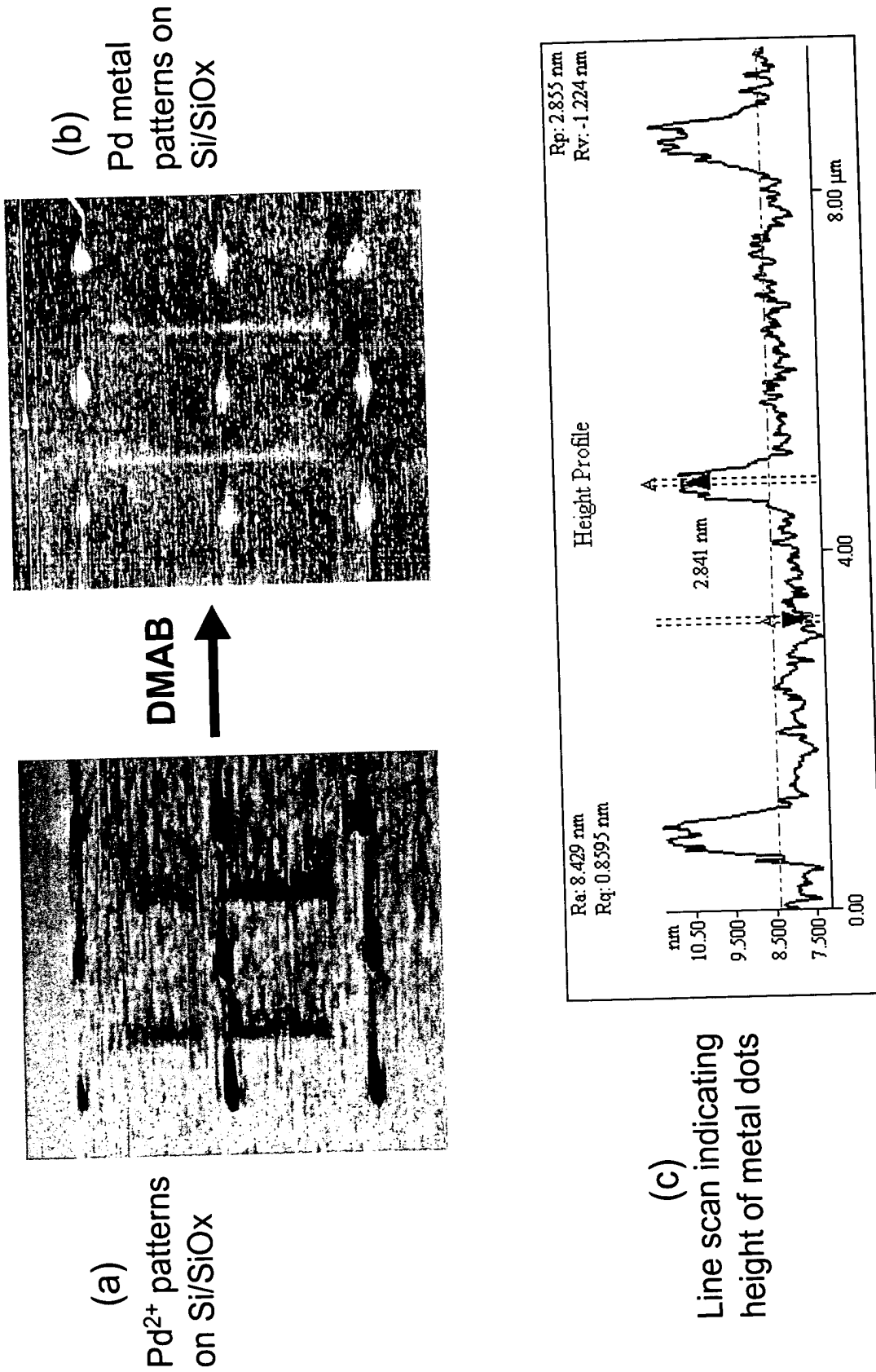
**Figure 8**



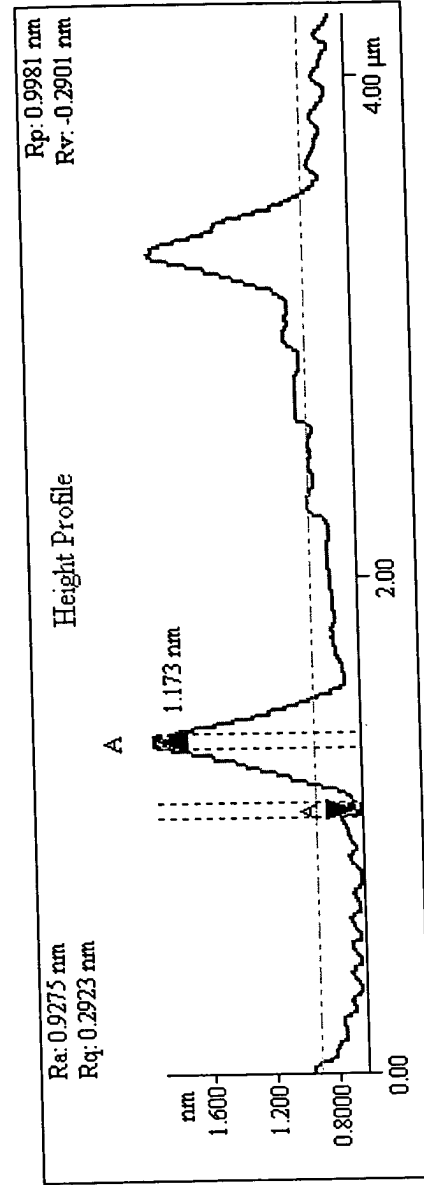
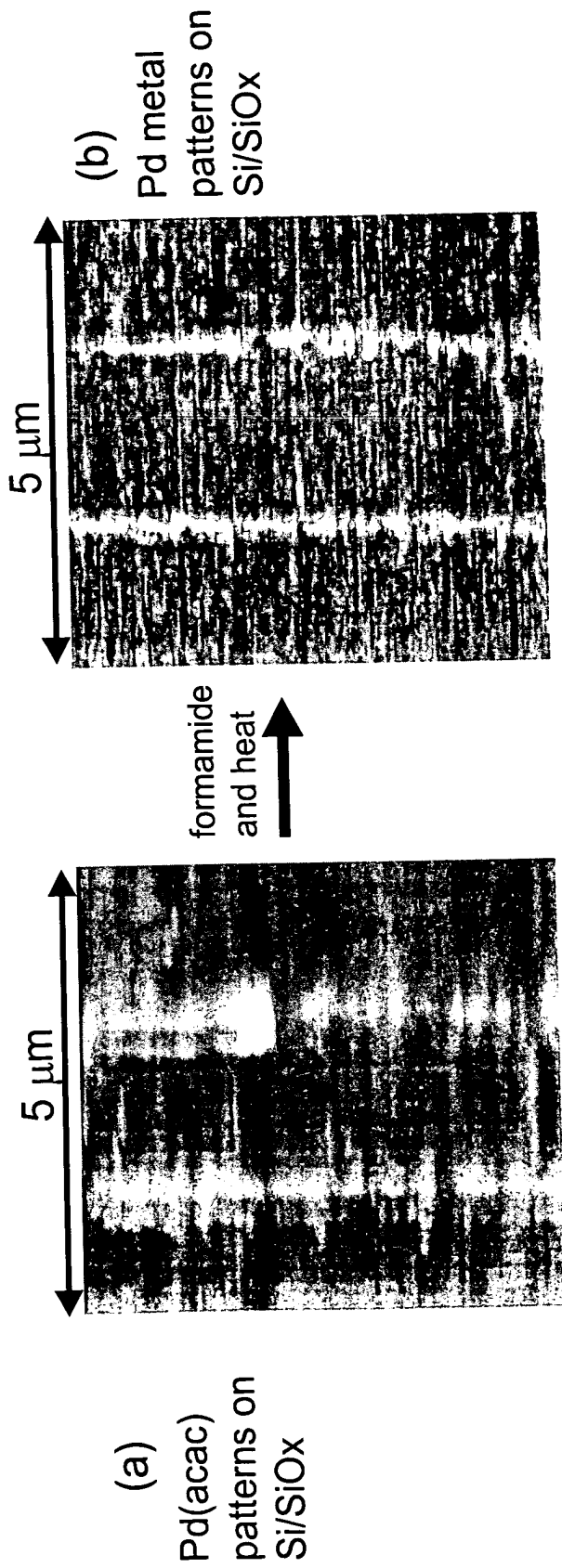
**Figure 9**



**Figure 10**

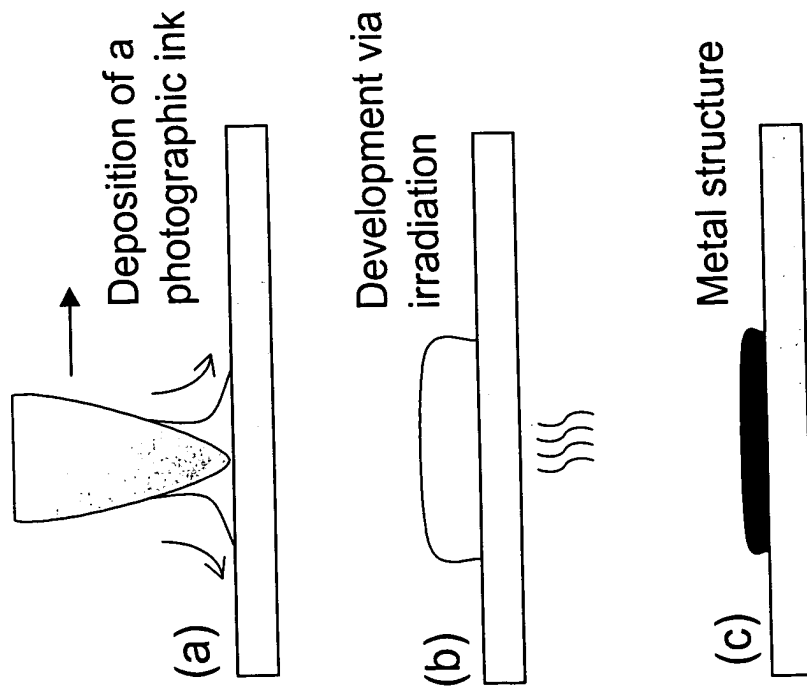
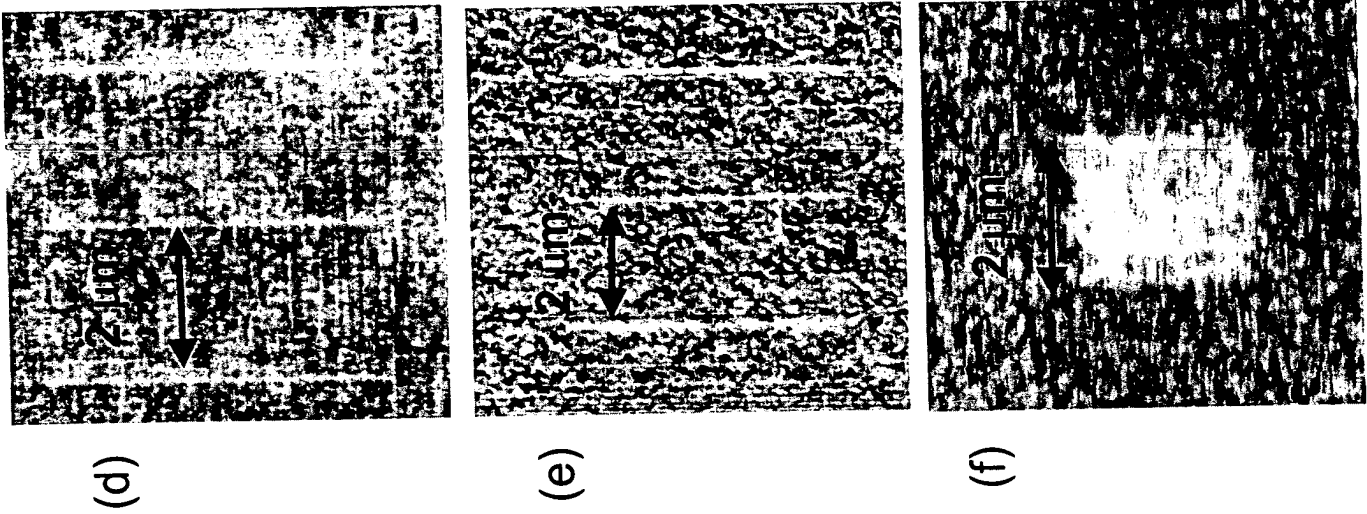


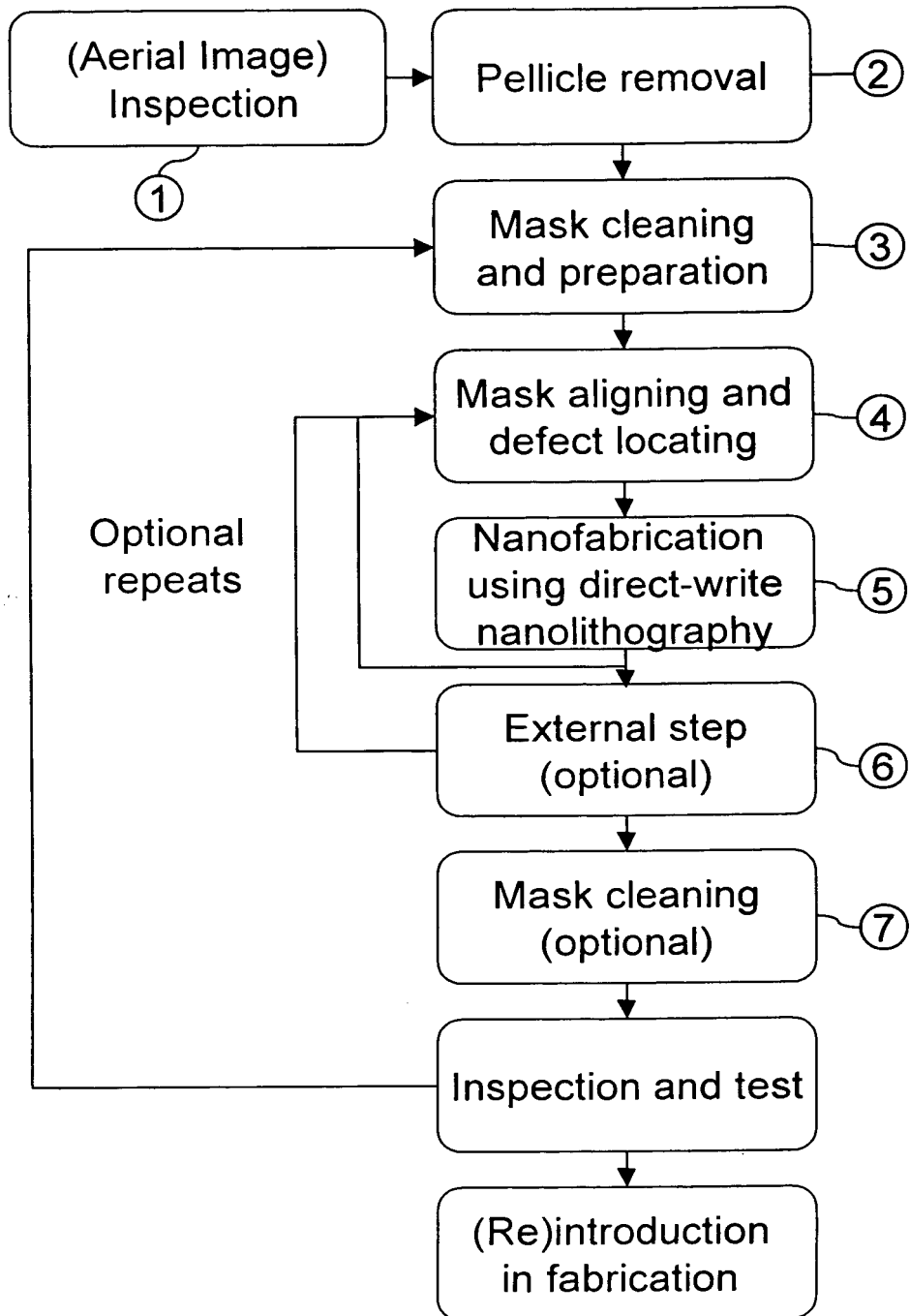
**Figure 11**



(c)  
 Line scan indicating  
 average height of  
 metal lines

**Figure 12**





**Figure 13**

**Figure 14A**

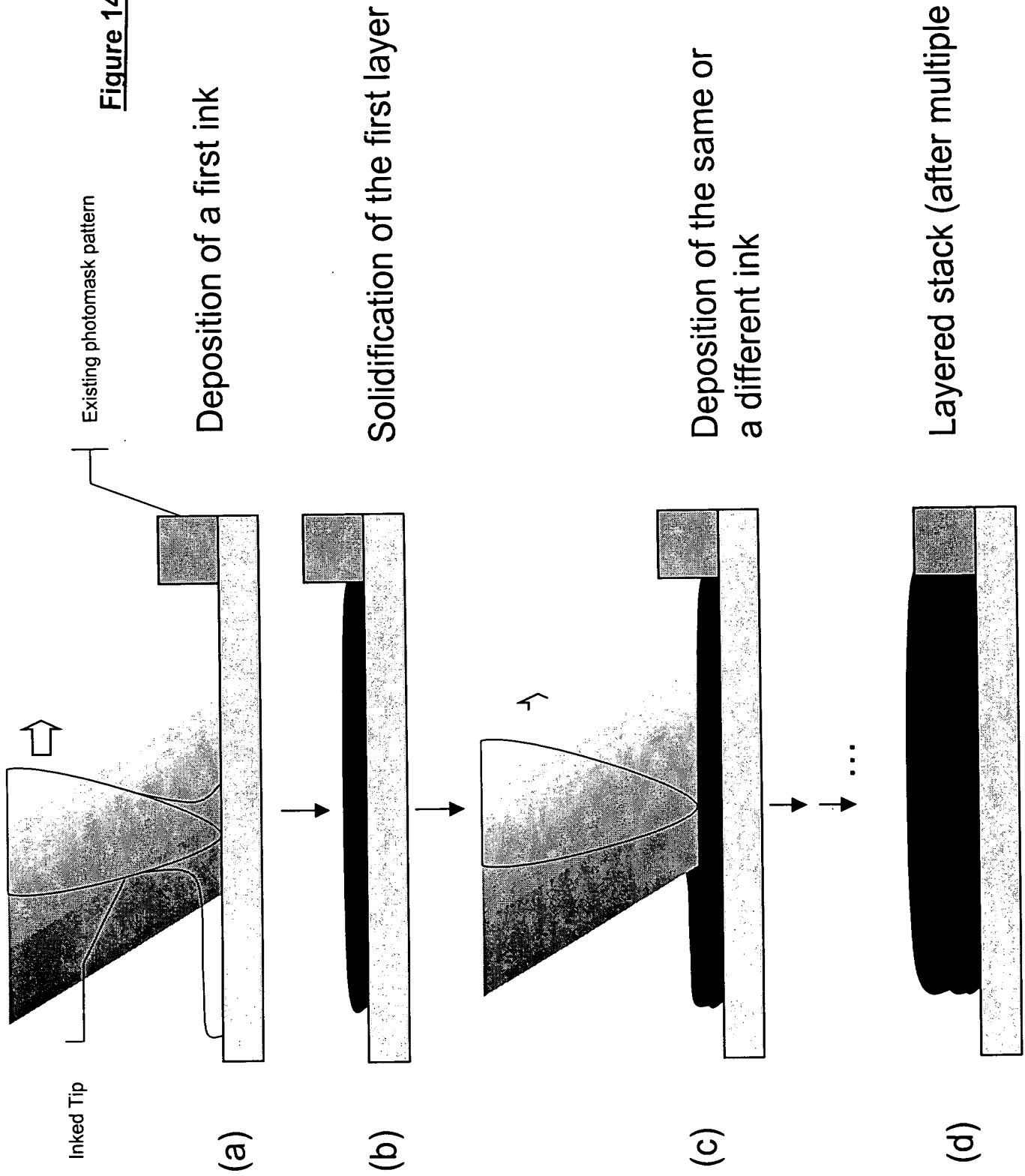


Figure 14B

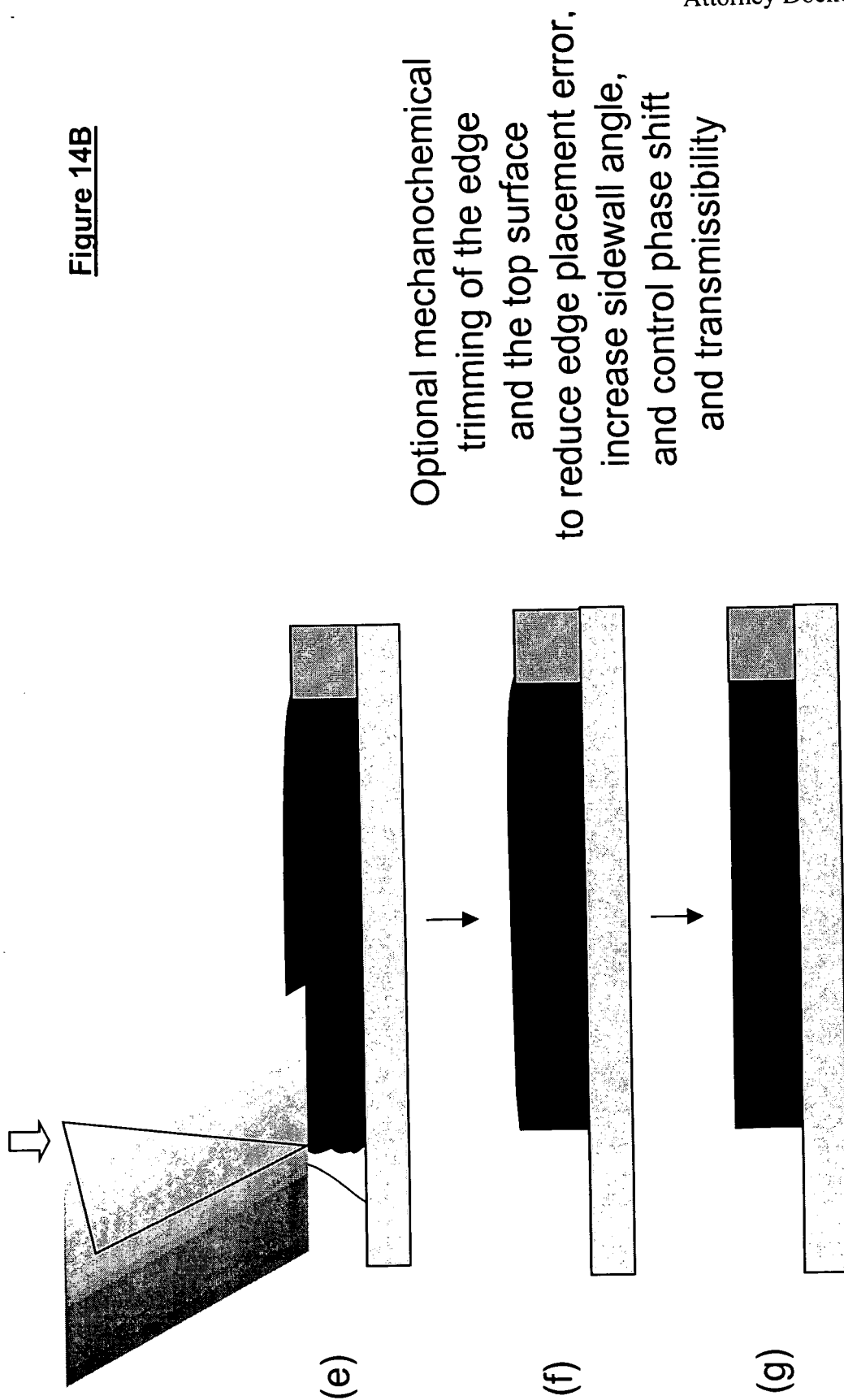
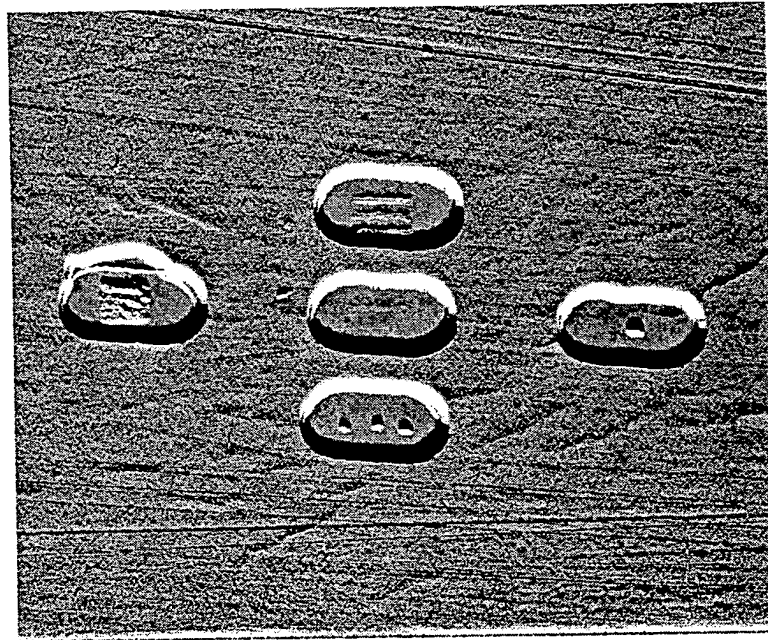




Figure 15

## Zoomed Out View



Sol-Gel Structures in one of  
the smallest features in Binary  
Mask

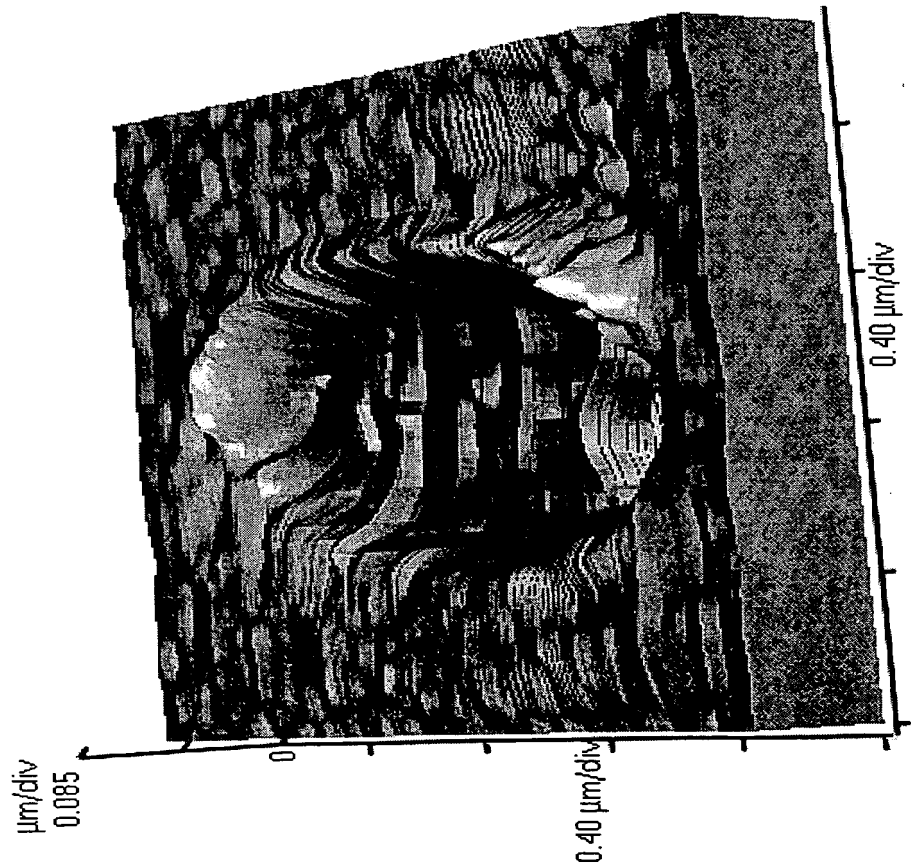
The features (5 holes) in the  
mask are  $1\mu\text{m} \times 2\mu\text{m}$ .

Nano Structures were  
successfully created in smaller  
features too.

Figure 16

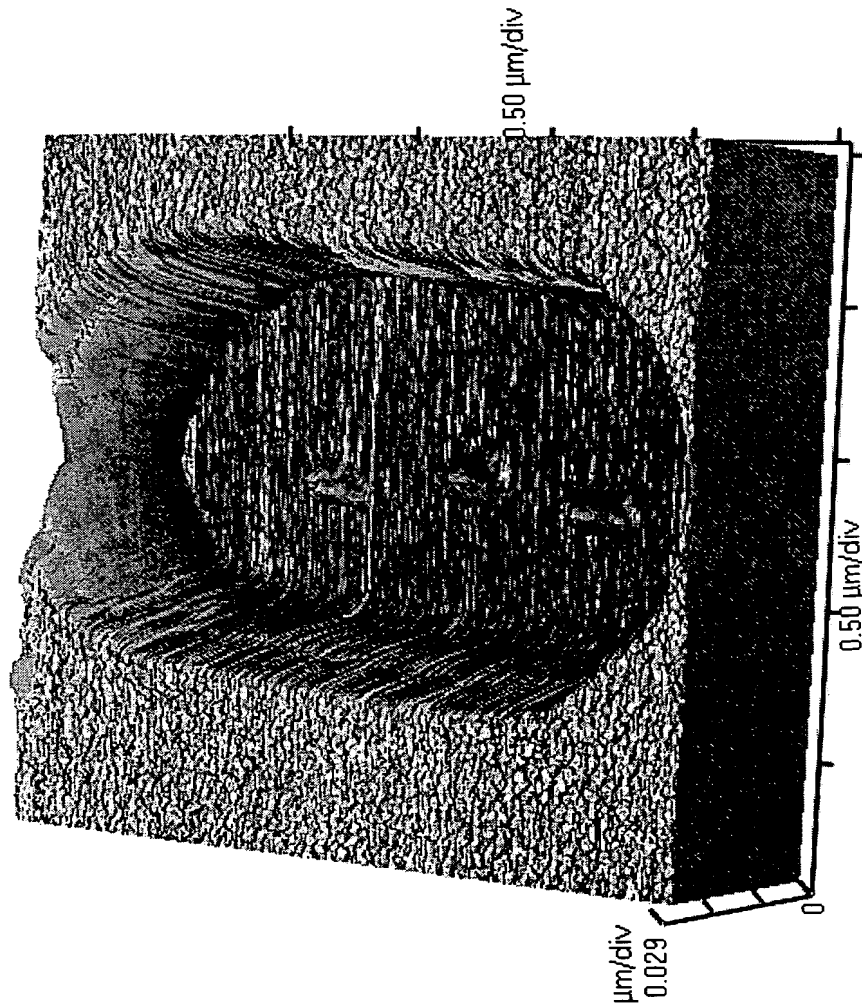
# Target Hole

Shown was the target feature to  
be used for deposition of Sol-  
Gel structures  
The dimensions of the hole are  
Length  $2\text{ }\mu\text{m}$   
Width  $1\text{ }\mu\text{m}$   
Height  $75\text{ nm}$



# Dots in the Features

Figure 17

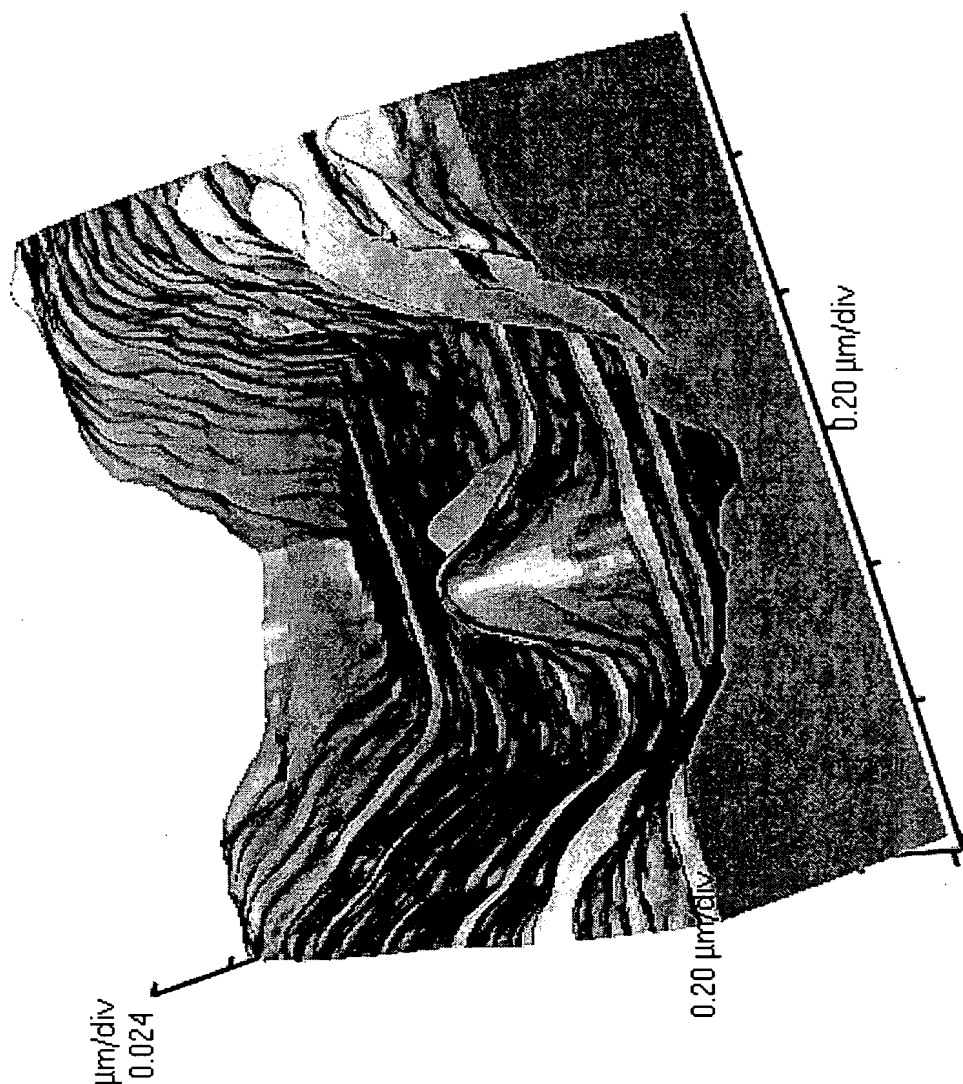


Dots were created, demonstrating the control over height of the feature and the registration. The dimensions starting from top feature

- H 17nm W 128 nm T 3 min
- H 17.5 nm W 150 nm T 3.5 min
- H 18.5 nm W 163 nm T 4 min

Figure 18

## A High Dot



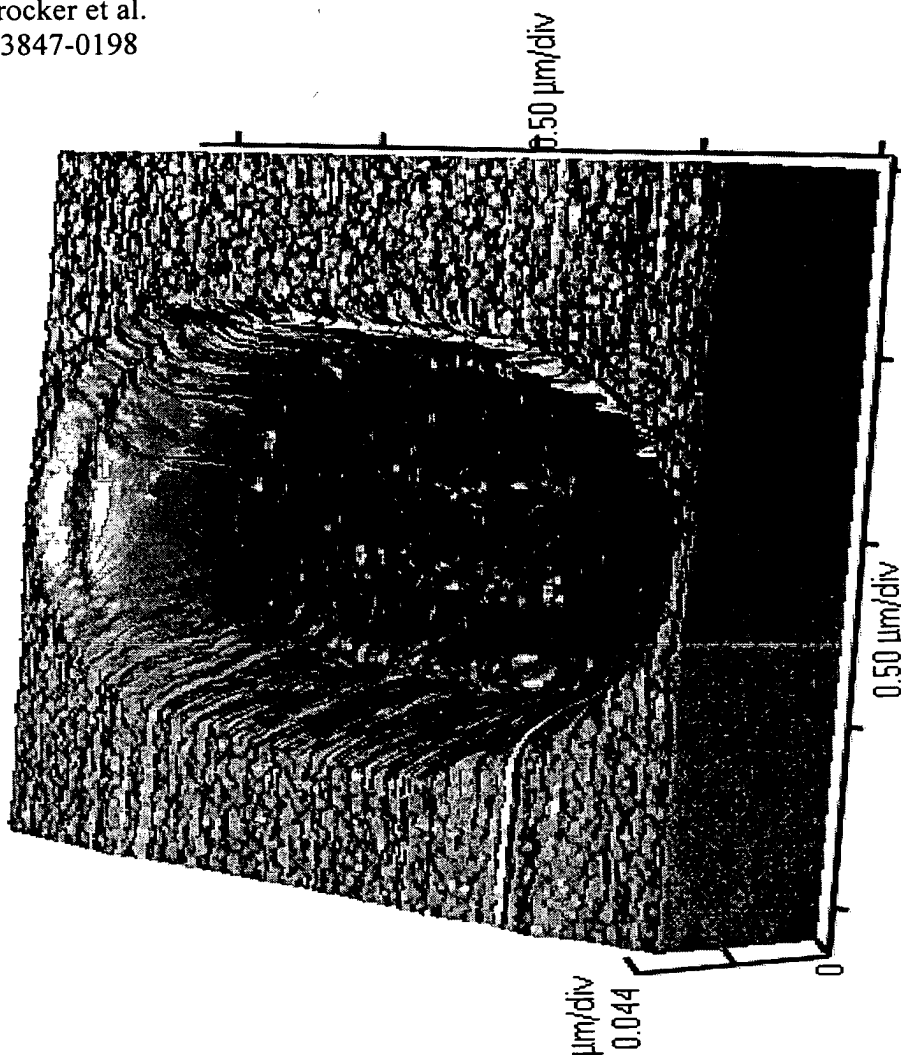
A dot 45.3 nm tall was created by holding the tip coated with sol-gel for 15 min. This demonstrates ability to create very high nano structures without loosing control over x and y dimensions.

**Figure 19**

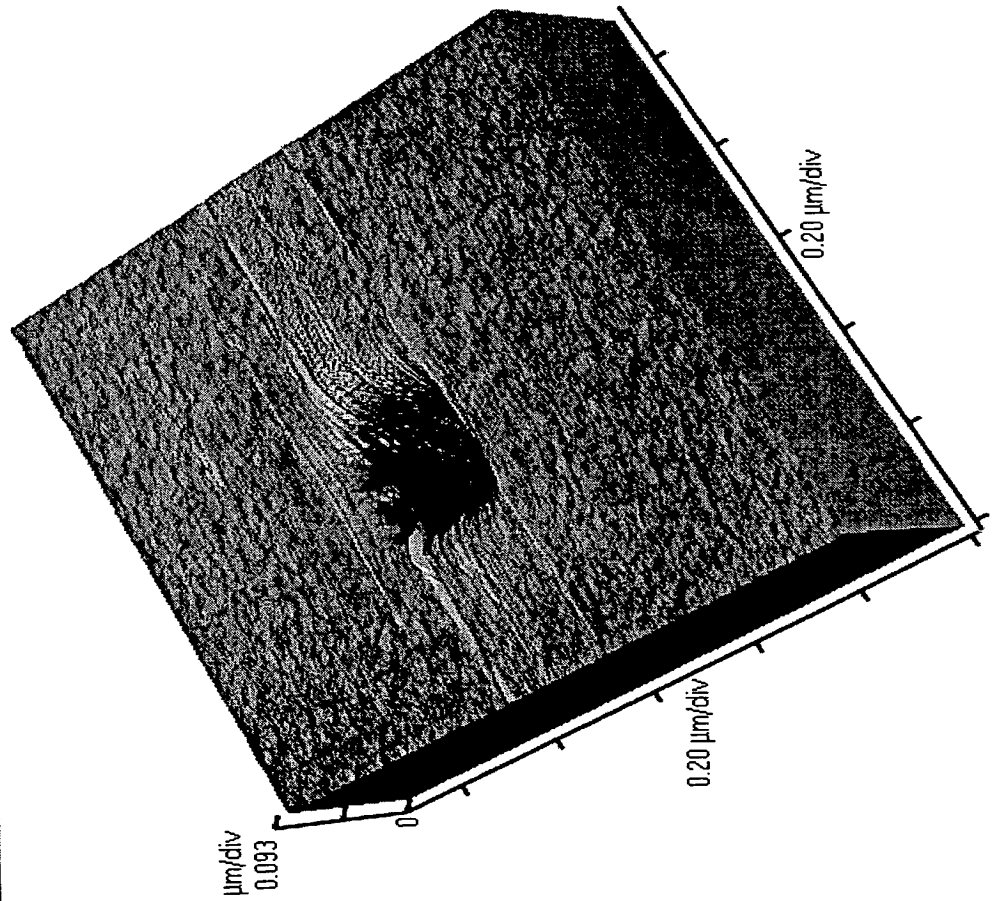
## Lines in the Feature

These three lines were created,  
one exactly alongside the defect  
edge. The dimensions for the lines  
starting from left are:

- H 15 nm W 162 nm T 6 min
- H 10 nm W 150 nm T 5 min
- H 5 nm W 138 nm T 4 min



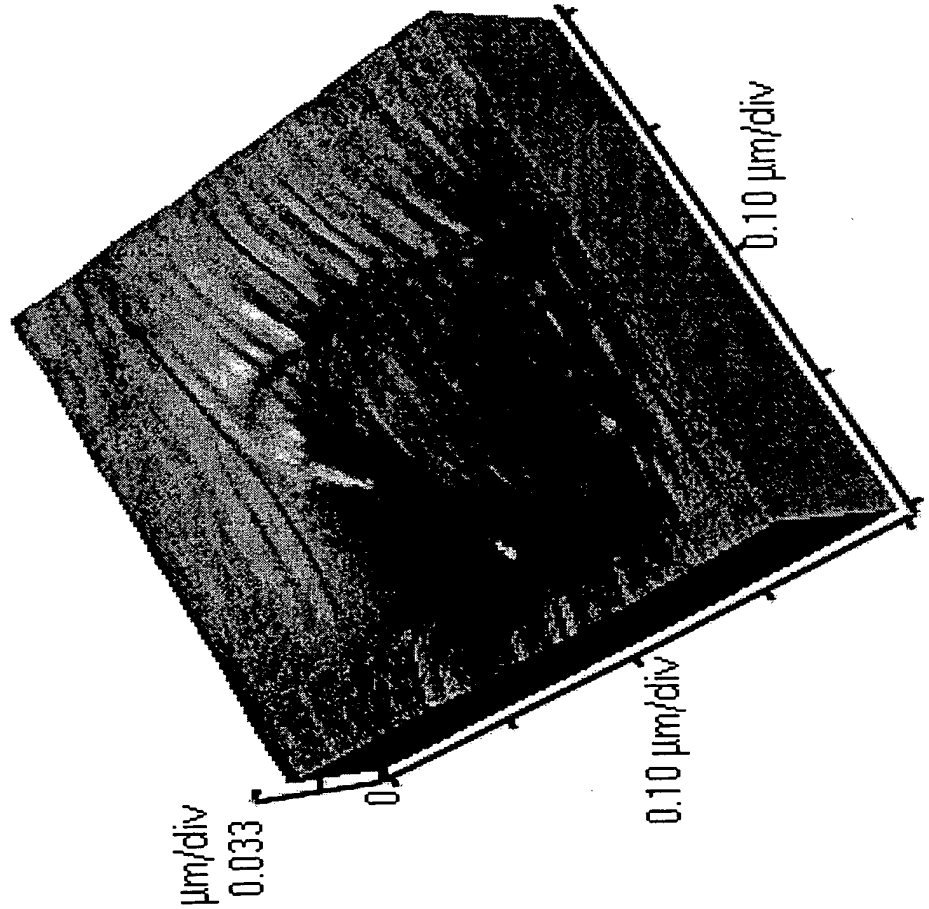
# Target Hole on FIBics Structures for Deposition of Metal Salt and sol-gel



This hole is ~200 nm wide and 100 nm deep. This was the target hole for deposition of sol-gel structure and metal ink.

Figure 20

# Sol-Gel in Features by FIBICS



An attempt to fill up a hole in features made with FIB. The average height of the feature deposited is 46 nm. A  $\text{SiN}_3$  tip was used in this experiment.

Sol-Gel composition same as mentioned before. Dwelling time was 14 min. The deposited structure were cured at  $120^\circ\text{C}$  for 6 min.

Figure 21

# Metal Salt filled in FIBics Structures

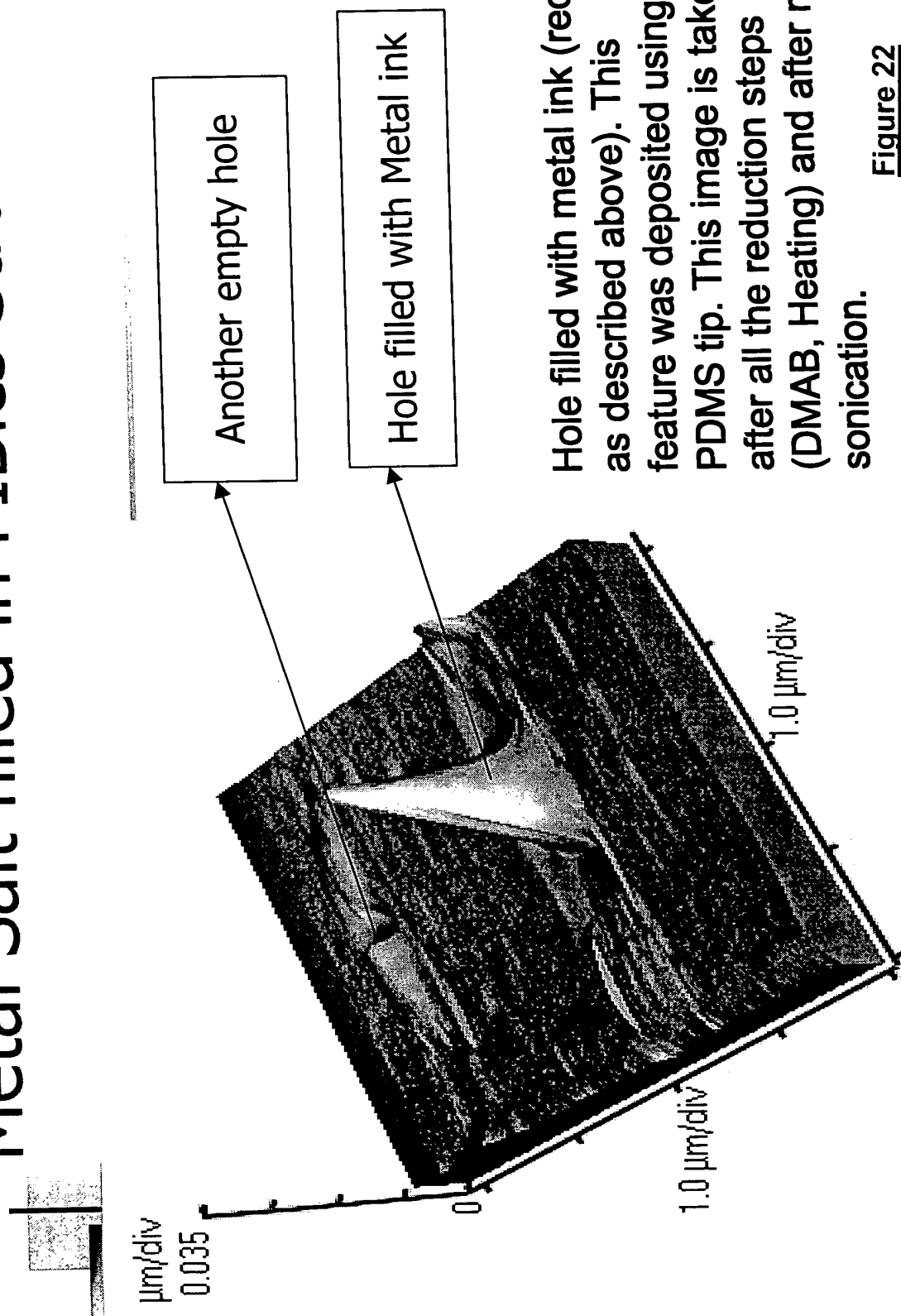


Figure 22



# Building up of Metal Structure by Layering

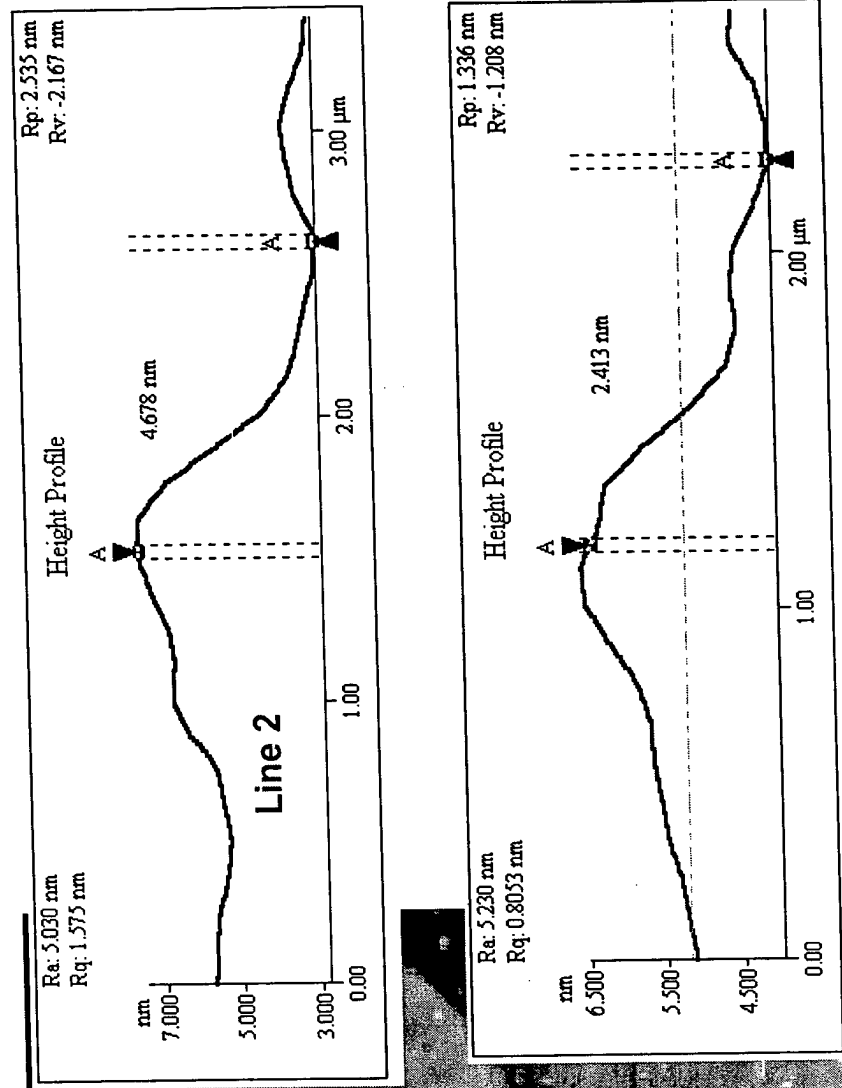
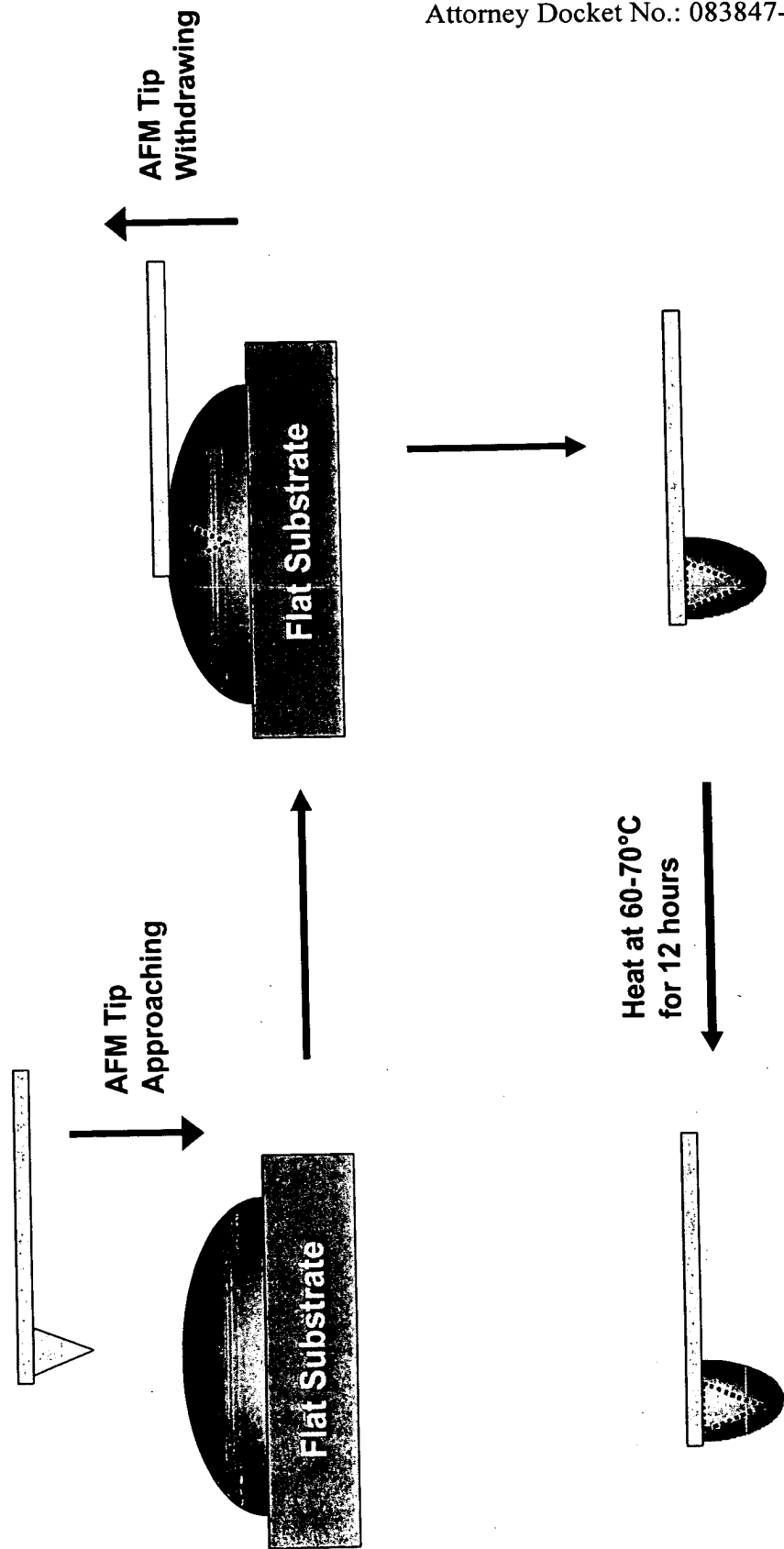


Figure 23

# Schematic Representation: Fabrication of PDMS-Coated DPN Stamp Tip



PDMS-coated DPN Stamp tip

Figure 24

# Optical Microscopy Image of a PDMS-Coated DPN Stamp Tip

Title: Nanometer-Scale Engineered Structures, Methods  
and Apparatus for Fabrication thereof, and Applications  
to Photomask Repair and Enhancement  
Inventor(s): Percy Van Crocker et al.  
Attorney Docket No.: 083847-0198

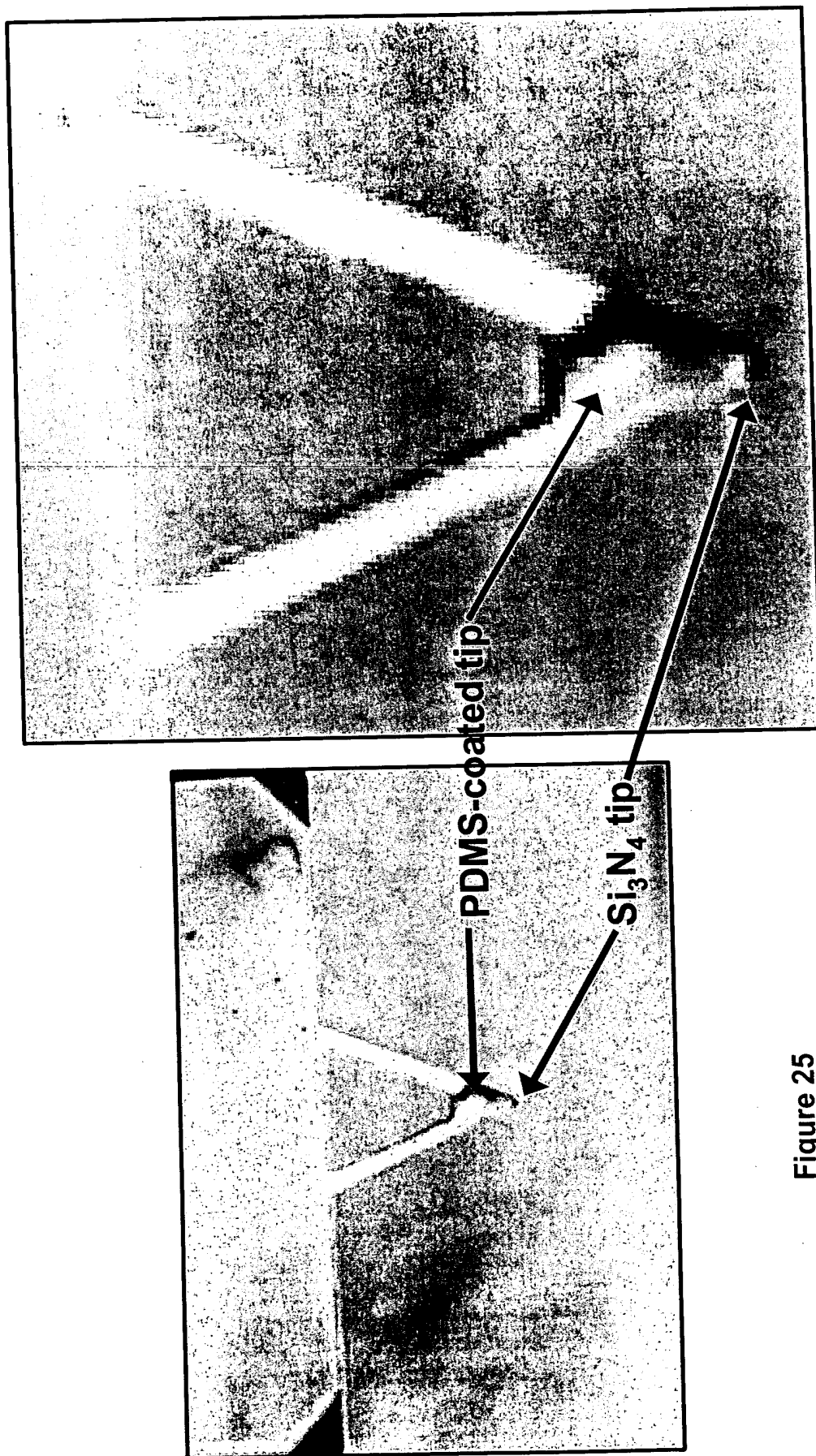
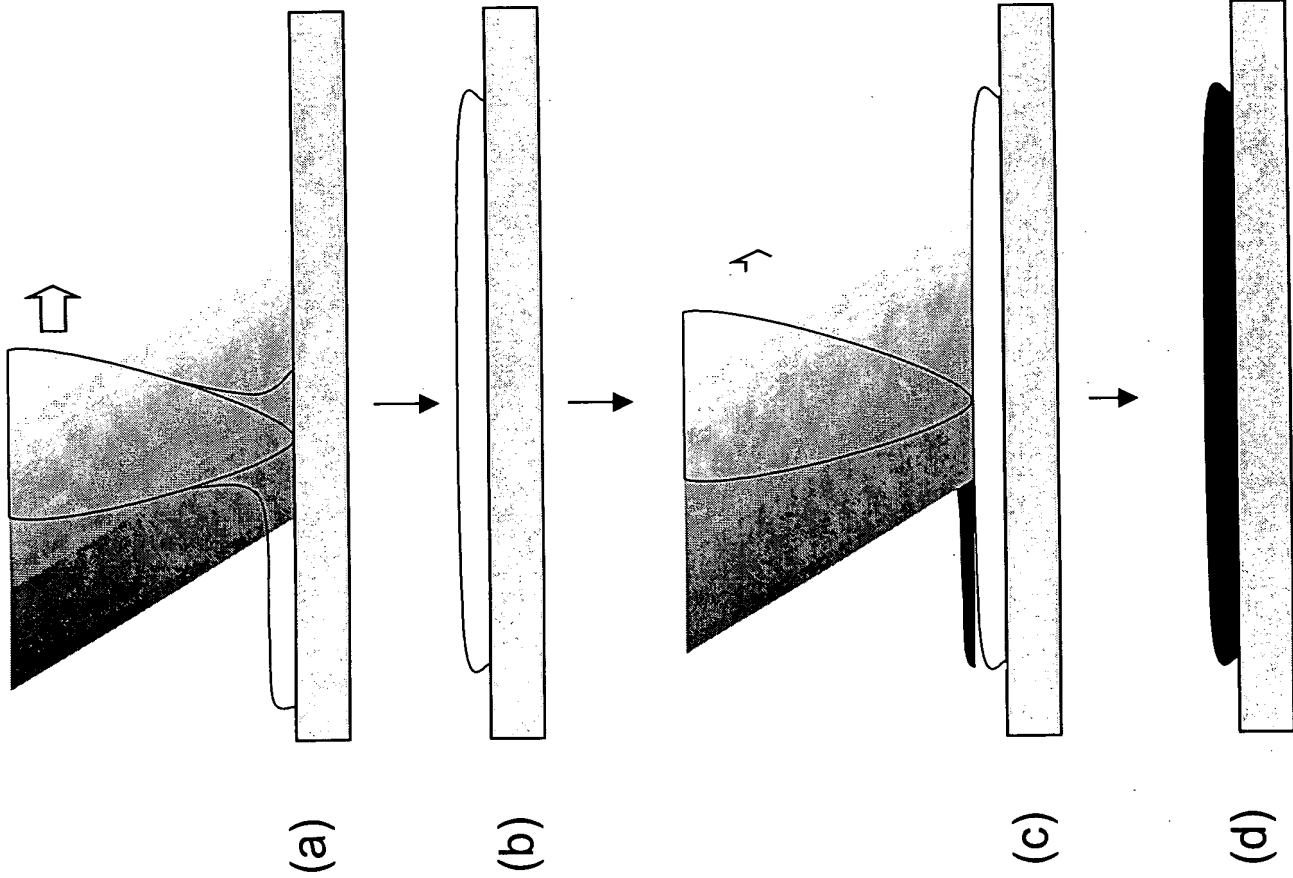


Figure 25

Figure 26



Deposition of a first ink

Mixing of a second, chemically  
reactive ink with the first

Chemical reaction and curing

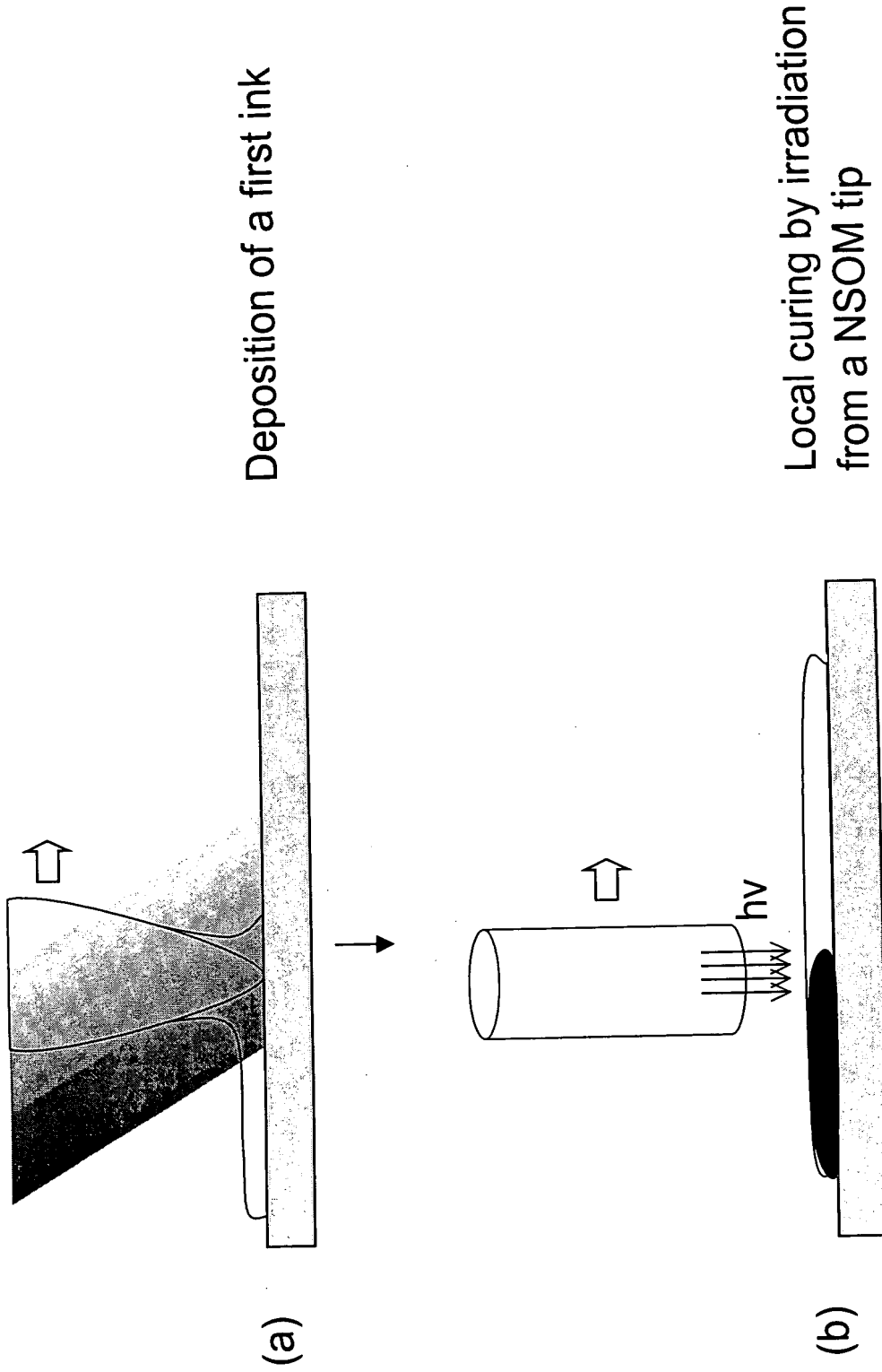


Figure 27